

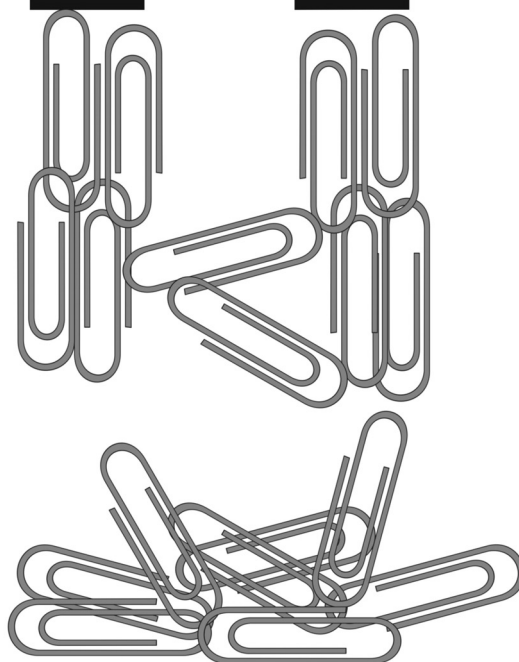
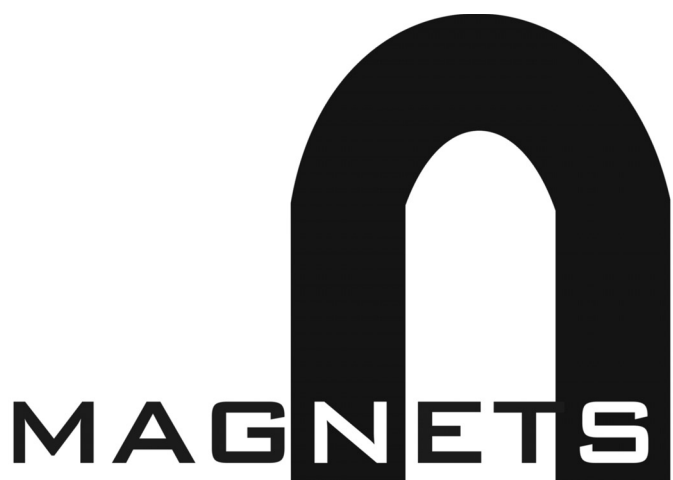
EXPLORING MAGNETS

Exploring Magnets is a hands-on, center-based exploration of the basic concepts of magnetism.



GRADE LEVEL
1-4

SUBJECT AREAS
Science
Social Studies
Math
Language Arts



NEED

2009-2010

Putting Energy into Education

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Teacher Advisory Board Vision Statement

NEED Mission Statement

The mission of the NEED Project is to promote an energy conscious and educated society by creating effective networks of students, educators, business, government and community leaders to design and deliver objective, multi-sided energy education programs.

In support of NEED, the national Teacher Advisory Board (TAB) is dedicated to developing and promoting standards-based energy curriculum and training.

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MATERIALS IN KIT

Teacher Guide with Student Worksheets
 5 Compasses
 5 Sets of Large Bar Magnets
 5 Sets of Horseshoe Magnets
 30 Rectangular Magnets with Holes
 5 Glass Marbles
 5 Wooden Disks
 5 Plastic Disks
 5 Boxes of Paperclips
 5 Sets of Metal Samples
 10 Plastic Containers
 25 Darning Needles
 1 Box of Iron Filings
 1 Small Bar Magnet
 Plastic Bubble Wrap
 5 Wooden Dowels
 5 Wooden Rectangles

MATERIALS NEEDED

Tape
 Water
 5 Pieces of Cloth
 5 Pieces of Paper
 5 Pennies, Dimes, Nickels, and Quarters
 5 Pieces of Aluminum Foil (12" x 36")
 15 Pieces of Construction Paper

These activities are designed for students in Grades one through four. Many of the activities require reading skills. For younger students with limited reading skills, it is suggested that the teacher have an aide, parent helper, or upper elementary student to assist.

EXPLORING MAGNETS KIT (Materials for 5 Centers): \$120.00



Correlations to National Science Content Standards

(Bolded standards are emphasized in the unit.)

Grades K–4

PRIMARY STANDARD A: SCIENCE AS INQUIRY

1. Abilities Necessary to do Scientific Inquiry

- a. Ask a question about objects, organisms, and events in the environment.
- b. Plan and conduct a simple investigation.
- c. Employ simple equipment and tools to gather data and extend the senses.**
- d. Use data to construct a reasonable explanation.**
- e. Communicate investigations and explanations.

PRIMARY STANDARD B: PHYSICAL SCIENCE

1. Properties of Objects and Materials

- a. Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances. Those properties can be measured using tools such as rulers, balances, and thermometers.**
- b. Objects are made of one or more materials, such as paper, wood, and metal. Objects can be described by the properties of the materials from which they are made, and those properties can be used to separate or sort a group of objects or materials.**

3. Light, Heat, Electricity, and Magnetism

- d. Magnets attract and repel each other and certain kinds of other materials.**

PRIMARY STANDARD D: EARTH AND SPACE SCIENCE

1. Properties of Earth Materials

- a. Earth materials are solid rocks and soils, water, and the gases of the atmosphere. The varied materials have different physical and chemical properties, which make them useful in different ways; for example, as building materials, as sources of fuel, or for growing the plants we use as food.
- b. Earth materials provide many of the resources that humans use.

PRIMARY STANDARD E: SCIENCE AND TECHNOLOGY

2. Understandings about Science and Technology

- a. People have always had questions about their world. Science is one way of answering questions and explaining the natural world.
- b. People have always had problems and invented tools and techniques to solve problems. Trying to determine the effects of solutions helps people avoid some new problems.
- c. Scientists and engineers often work in teams with different individuals doing different things that contribute to the results. This understanding focuses primarily on teams working together and secondarily, on the combination of scientist and engineer teams.
- d. Women and men of all ages, backgrounds, and groups engage in a variety of scientific and technological work.
- e. Tools help scientists make better observations, measurements, and equipment for investigations. They help scientists see, measure, and do things that they could not otherwise see, measure, and do.

Teacher Guide

TEACHER DEMONSTRATIONS AND CENTER-BASED EXPLORATIONS INTRODUCE STUDENTS TO THE BASIC CONCEPTS OF MAGNETS.

BACKGROUND

Students explore the concepts of magnetic force with a variety of magnets and experiments, making predictions, recording observations and data, and drawing conclusions.

CONCEPTS

- In most materials, half of the electrons are spinning in one direction and half are spinning in the other, and the spinning electrons are scattered throughout the materials.
- In a magnet, most of the electrons at one pole are spinning in one direction and most of the electrons at the other pole are spinning in the opposite direction, producing a magnetic force field.
- Because of the magnetic field, magnets are special materials that are attracted to each other and other materials such as some metals.
- Like poles of magnets repel each other, opposite poles of magnets attract each other.
- Magnets come in a variety of shapes and sizes.
- Some objects can be magnetized by contact with a magnet.
- The needle of a compass is magnetized.
- The earth is a magnet with North and South poles.

TIME

Five 45-minute classes.

PROCEDURE

Step One—Preparation

- Familiarize yourself with the guide and the equipment in the kit. Make copies of the student worksheets, unit exam pages, and transparencies.
- Using a permanent marker, mark the N and S poles of the magnets and label one magnet of each set with the number 1 and one with the number 2.
- Make a day-by-day schedule for the unit according to the skill level of your students and the time you can allot to the activities each day. Each activity is explained in detail beginning on the next page, with the materials needed and estimated time for completion.
- Collect the materials that are not included in the kit, listed on page 3.
- Set up five centers and divide your students into five groups. Each day, set out the materials the students will need to conduct the day's scheduled activities. *Make sure the magnets are stored separately from the other materials. The paperclips and darning needles can become magnetized upon repeated contact with the magnets, and the compass can be ruined. Make sure students keep magnets away from computer monitors and television screens.*

Background Information: Magnets and Magnetism

Everything in the universe is made of atoms—they are the building blocks of the universe. Atoms are so small that millions of them would fit on the head of a pin. Atoms are made of even smaller particles. The center of an atom is called the nucleus. It is made of particles called protons and neutrons. The protons and neutrons are very small, but electrons are much, much smaller. Electrons spin around the nucleus in shells a great distance from the nucleus. If the nucleus were the size of a tennis ball, the atom would be the size of the Empire State Building. Atoms are mostly empty space.

If you could see an atom, it would look a little like a tiny center of balls surrounded by giant invisible bubbles (or shells). The electrons would be on the surface of the bubbles, constantly spinning and moving to stay as far away from each other as possible. Electrons are held in their shells by an electrical force.

The protons and electrons of an atom are attracted to each other. They both carry an electrical charge. An electrical charge is a force within the particle. Protons have a positive charge (+) and electrons have a negative charge (-). The positive charge of the protons is equal to the negative charge of the electrons. Opposite charges attract each other. When an atom is in balance, it has an equal number of protons and electrons. The neutrons carry no charge and their number can vary.

In most materials, the forces are in balance. Half of the electrons are spinning in one direction; half are spinning in the other, and they are randomly scattered throughout the materials. Magnets are different. In magnets, most of the electrons at one end are spinning in one direction. Most of the electrons at the other end are spinning in the opposite direction.

This creates an imbalance in the forces between the ends (poles) of a magnet. This creates a magnetic field around a magnet. A magnet is labeled with North (N) and South (S) poles. The magnetic force in a magnet flows from the North pole to the South pole. (See Transparency 1)

Like poles of magnets repel each other and opposite poles attract each other. If you try to push the South poles together, they repel each other. Two North poles also repel each other. Turn one magnet around and the North (N) and the South (S) poles are attracted to each other. The magnets come together with a strong force. Just like with protons and electrons, opposite magnetic forces attract.

Metals that can be magnetized include iron, nickel, and cobalt. Steel is made of iron and other metals. The Earth is a magnet with North and South poles, because its core is iron. Scientists believe that the Earth's poles have reversed several times in the past, but they don't know why.

DAY 1: MAGNETS ATTRACT EACH OTHER AND SOME OTHER MATERIALS (45 minutes)

MATERIALS IN KIT FOR EACH CENTER: 2 bar magnets, 2 horseshoe magnets, glass marble, wood disk, plastic disk, metal paperclip, samples of steel, aluminum, brass, and copper.

MATERIALS NEEDED FOR EACH CENTER: piece of paper, piece of cloth, cup of water, penny, nickel, dime, and quarter.

Objective: To learn what materials magnets attract.

- Introduce magnets as the topic of exploration. Discuss what students think they already know about magnets. (Many will think magnets attract all metals.)
- Distribute the Student Guides to the students and have them write their names on the cover.
- **Go to Student Worksheets 1-4.** Review the procedures for the experiments with the students. For younger students, review one worksheet at a time, then have the students complete the worksheet before moving to the next worksheet. Emphasize that students must make predictions BEFORE they begin to conduct the experiment.
- Assign students to the centers and monitor as they conduct the experiments.
- Review these concepts: like poles repel, opposite poles attract, magnets attract only some metals, not all.

Day 2: MAGNETIC FORCE (45 minutes)

MATERIALS IN KIT FOR EACH CENTER: 2 bar magnets, 2 horseshoe magnets, and box of paperclips.

Objective: To measure and compare the force of several magnets.

- Review the concepts from Day 1.
- **Go to Student Worksheets 5-8.** Review the procedures for the experiments with the students. For younger students, review one worksheet at a time, then have the students complete the worksheet before moving to the next worksheet. Emphasize that students must make predictions BEFORE they begin to conduct the experiment.
- Assign students to the centers and monitor as they conduct the experiments.
- Review these concepts: different magnets have different amounts of force, different areas of magnets have different amounts of force.

Day 3: CHANGING MAGNETIC FORCE (45 minutes)

MATERIALS IN KIT FOR EACH CENTER: 2 bar magnets, 2 horseshoe magnets, box of paperclips, plastic containers for water, and plastic bubble wrap.

MATERIALS NEEDED FOR EACH CENTER: water, construction paper, and aluminum foil.

Objective: To explore things that can change or block magnetic force.

- Review concepts from Days 1 and 2.
- Go to Student Worksheets 9-12. Review the procedures for the experiments on the worksheets with the students. For younger students, review one worksheet at a time, then have the students complete that worksheet before moving to the next worksheet. Emphasize that students must make predictions BEFORE they begin to conduct the experiment.
- Cut the bubble wrap into five pieces—one for each center. Provide several pieces of construction paper and lengths of aluminum foil for each center. Explain to the students that it may be easier to simply fold the bubble wrap, construction paper and aluminum foil, rather than cutting them into pieces.
- Assign students to the centers and monitor as they conduct the experiments.
- Review these concepts: placing magnets together can change the force of the magnets, placing things between magnets can block the force of the magnets, changing temperature does not change the force of magnets.

Day 4: FUN WITH MAGNETS (45 minutes)

MATERIALS IN KIT FOR EACH CENTER: 1 bar magnet, 1 darning needle, 1 compass, 1 plastic disk, 1 plastic container for water, 5 rectangular magnets with holes, and 1 wooden stick.

MATERIALS NEEDED FOR EACH CENTER: water and tape.

MATERIALS IN KIT FOR TEACHER DEMO: 1 plastic box of iron filings, 1 small bar magnet, 1 horseshoe magnet, and 1 rectangular magnet.

MATERIALS NEEDED FOR TEACHER DEMO: Transparencies of pages 9-10.

Objectives: To make a magnet, make magnets levitate, and demonstrate magnetic fields.

Go to Student Worksheets 13-14. Review the procedures for the experiments on the worksheets with the students. For younger students, review one worksheet at a time, then have the students complete that worksheet before moving to the next worksheet.

Assign students to the centers and monitor as they conduct the experiments.

TRANSPARENCIES: Use the Transparency Masters on page 9-10 to show magnetic force fields. Discuss the fact that the Earth has a magnetic force field like a bar magnet because it has an iron core, which is why we talk about the North and South poles of the Earth. This is why a compass points to the North pole. The needle of the compass is a magnet.

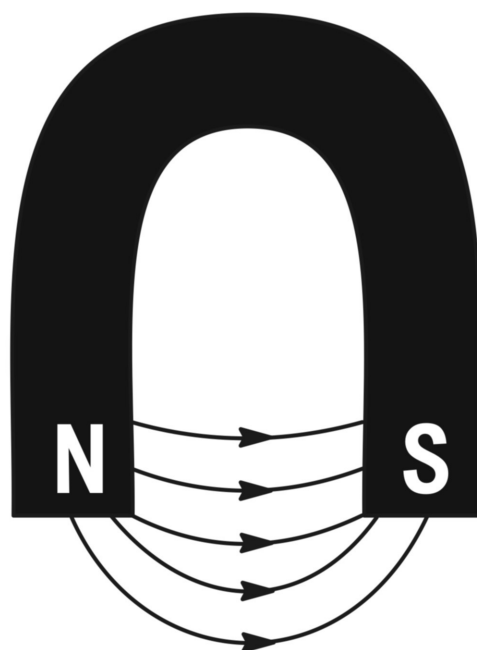
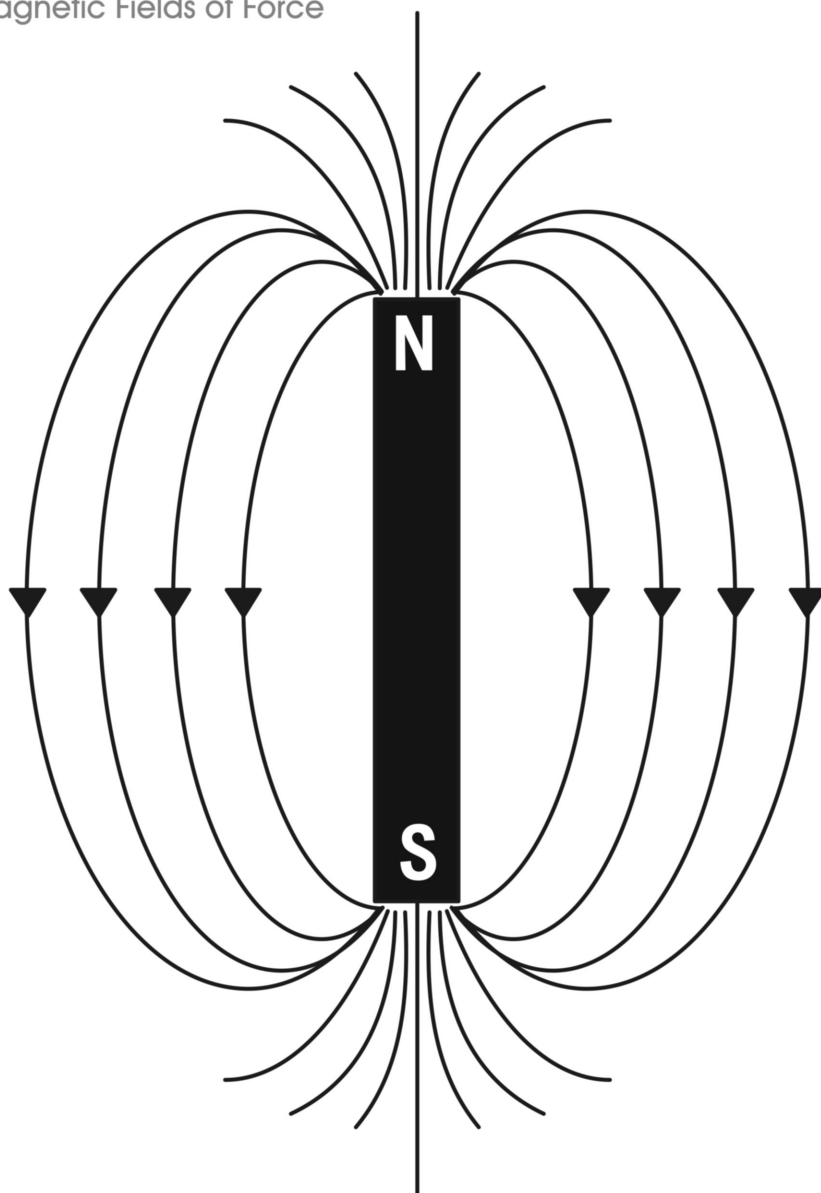
TEACHER DEMONSTRATION: Use the box of iron filings to demonstrate the magnetic fields of the small bar magnet, horseshoe magnet, and rectangular magnet to the students. A very strong overhead projector can be effective, but it is better to have the students observe in small groups. Lay the box flat on a table and gently shake it to spread the filings. Place one magnet at a time on the box and magnetic force field lines will develop inside the box. Allow the students to observe. Shake the box each time you place a magnet on it.

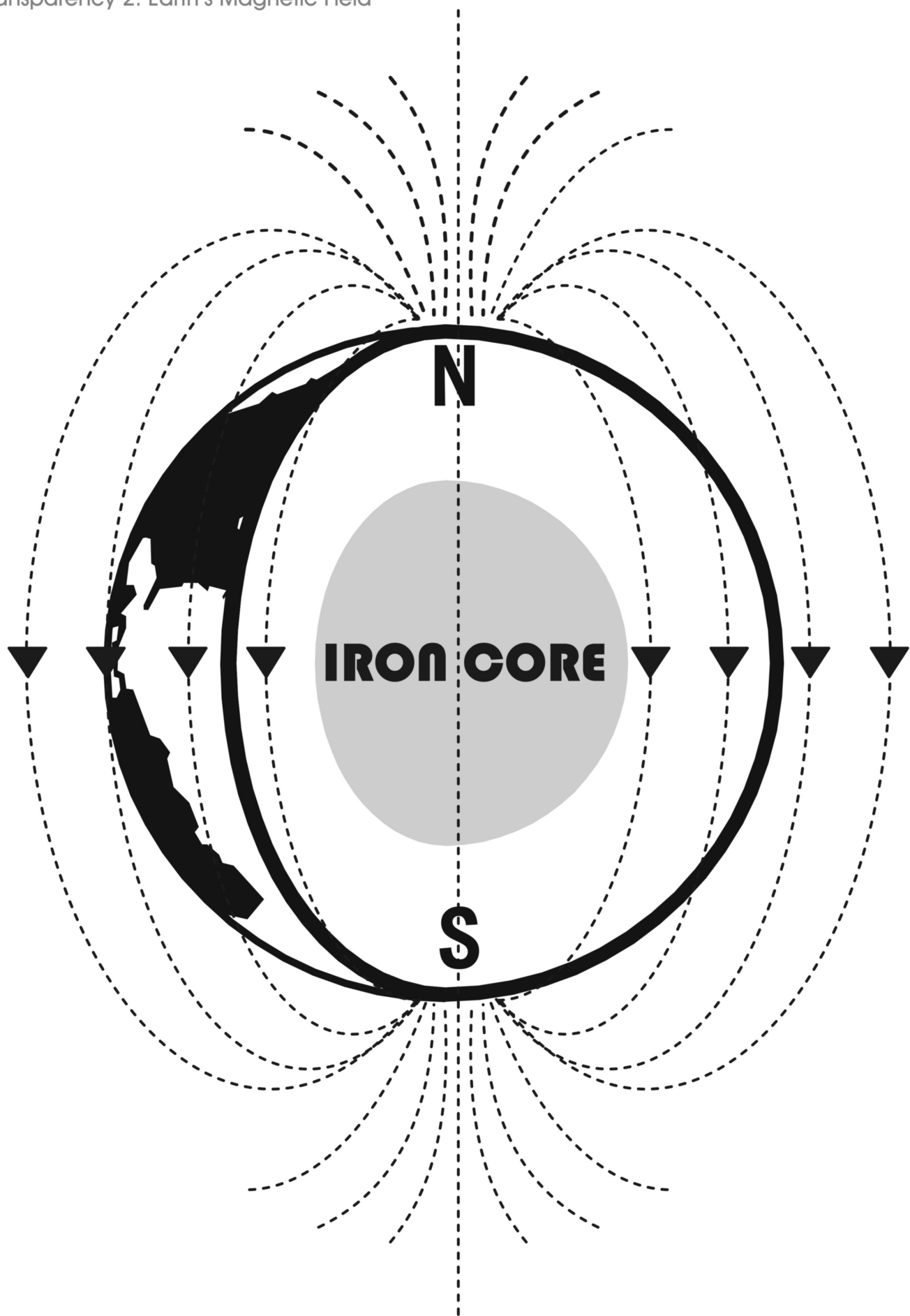
Review these concepts: a metal needle can be magnetized by contact with a magnet; a compass needle is a magnet; the Earth is a giant magnet with North and South poles.

Day 5: EVALUATION (45 minutes)

Objective: To evaluate the effectiveness of the unit.

- Have each student complete the self-assessment and group-assessment on page 25.
- Evaluate the effectiveness of the unit using the Unit Exam on pages 26-28.
- Have each student design a product that uses magnets.





MAGNETS 1

PREDICTION

1. attract repel

1.



2. attract repel

2.



3. attract repel

3.



4. attract repel

4.



5. attract repel

5.



RESULT

1. attract repel

2. attract repel

3. attract repel

4. attract repel

5. attract repel

CONCLUSION: What did you learn?

MAGNETS 2

Step 1: PREDICT: Look at Picture 1. Predict what will happen.

Step 2: EXPERIMENT 1: Place the magnets together like in Picture 1. Record your observation.

Step 3: PREDICT: Look at Picture 2. Predict what will happen.

Step 4: EXPERIMENT 2: Place the magnets together like in Picture 2. Record your observation.

Step 5: PREDICT: Look at Picture 3. Predict what will happen.

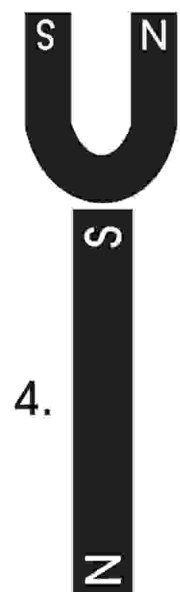
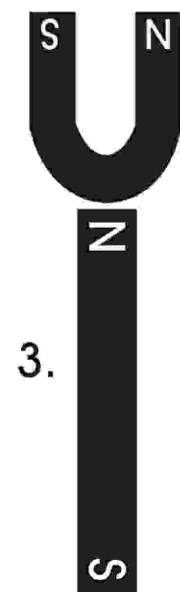
Step 6: EXPERIMENT 3: Place the magnets together like in Picture 3. Record your observation.

Step 7: PREDICT: Look at Picture 4. Predict what will happen.

Step 8: EXPERIMENT 4: Place the magnets together like in Picture 4. Record your observation.

Step 9: PREDICT: Look at Picture 5. Predict what will happen.

Step 10: EXPERIMENT 5: Place the magnets together like in Picture 5. Record your observation.



PREDICTION

RESULT

Picture 1:	attract	repel	attract	repel
Picture 2:	attract	repel	attract	repel
Picture 3:	attract	repel	attract	repel
Picture 4:	attract	repel	attract	repel
Picture 5:	attract	repel	attract	repel

CONCLUSION: What did you learn?

MAGNETS 3

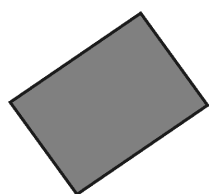
Some materials attract magnets and other materials do not.

Step 1: PREDICT: Predict which materials the magnets will attract in the Prediction Column.

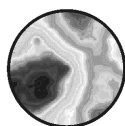
Step 2. EXPERIMENT 1: Touch the N pole of Bar Magnet 1 to each material. Record your data in the Result Column.

Step 3. EXPERIMENT 2: Touch the S pole of Bar Magnet 1 to each material. Record your data in the Result Column.

PREDICTION			RESULT				
				N POLE		S POLE	
Paper	yes	no	Paper	yes	no	yes	no
Glass	yes	no	Glass	yes	no	yes	no
Wood	yes	no	Wood	yes	no	yes	no
Plastic	yes	no	Plastic	yes	no	yes	no
Cloth	yes	no	Cloth	yes	no	yes	no
Metal	yes	no	Metal	yes	no	yes	no
Water	yes	no	Water	yes	no	yes	no



Piece of
Paper



Glass
Marble



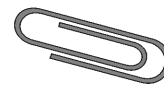
Wood
Disk



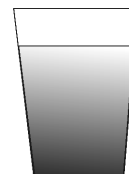
Plastic
Disk



Piece of
Cloth



Metal
Paperclip



Cup of
Water

CONCLUSION: What did you learn?

MAGNETS 4

Are all metals attracted to magnets?

Step 1: PREDICT: Look at the four samples of metal.

Predict which metals the magnets will attract in the Prediction Column.

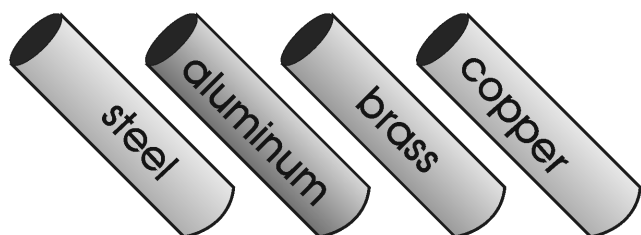
Step 2. EXPERIMENT 1: Touch the bar magnet to each metal.

Record your data in the Result Column.

Step 3. PREDICT: Look at the coins. Predict which coins will be attracted to the magnet.

Step 4. EXPERIMENT 2: Touch the bar magnet to the coins. Record your data.

PREDICTION			RESULT		
Copper	yes	no	Copper	yes	no
Brass	yes	no	Brass	yes	no
Aluminum	yes	no	Aluminum	yes	no
Steel	yes	no	Steel	yes	no
Penny	yes	no	Penny	yes	no
Nickel	yes	no	Nickel	yes	no
Dime	yes	no	Dime	yes	no
Quarter	yes	no	Quarter	yes	no



CONCLUSION: What did you learn?

MAGNETS 5

Step 1: PREDICT: How many paperclips can the N pole of Bar Magnet 1 lift? Record your prediction.

Step 2: EXPERIMENT 1: Put the paperclips in a pile. Place the N pole of Bar Magnet 1 into the paperclips as shown in the picture. Slowly lift it. Record the number of paperclips lifted by the magnet as Trial 1. Repeat and record as Trial 2.

Step 3: PREDICT: Predict how many paperclips the S pole of Bar Magnet 1 can lift.

Step 4: EXPERIMENT 2: Conduct 2 trials with the S pole of Bar Magnet 1. Record your data.

Step 5: PREDICT: Predict how many paperclips the N pole of Bar Magnet 2 can lift.

Step 6: EXPERIMENT 3: Conduct 2 trials with the N pole of Bar Magnet 2. Record your data.

Step 7: PREDICT: Predict how many paperclips the S pole of Bar Magnet 2 can lift.

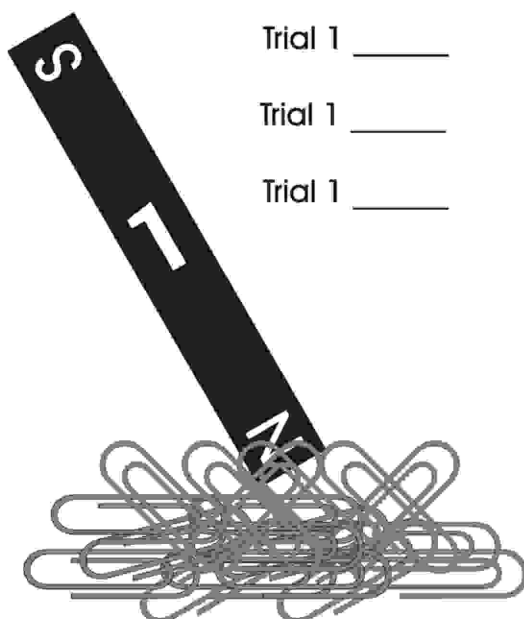
Step 8: EXPERIMENT 4: Conduct 2 trials with the S pole of Bar Magnet 2. Record your data.

PREDICTION

Bar Magnet 1 - N pole	_____
Bar Magnet 1 - S pole	_____
Bar Magnet 2 - N pole	_____
Bar Magnet 2 - S pole	_____

RESULT

Trial 1 _____	Trial 2 _____
Trial 1 _____	Trial 2 _____
Trial 1 _____	Trial 2 _____
Trial 1 _____	Trial 2 _____



CONCLUSION: What did you learn?

MAGNETS 6

Step 1: PREDICT: Predict how many paperclips Horseshoe 1 can lift.

Step 2: EXPERIMENT 1: Place Horseshoe 1 into the paperclips as shown in Picture 1. Slowly lift it. Record the number of paperclips lifted by the magnet as Trial 1.

Repeat the experiment twice with Horseshoe Magnet 1 and record as Trials 2 & 3.

Step 4: PREDICT: Predict how many paperclips Horseshoe 2 can lift.

Step 5: EXPERIMENT 2: Conduct 3 trials with Horseshoe 2. Record your data.

PREDICTION

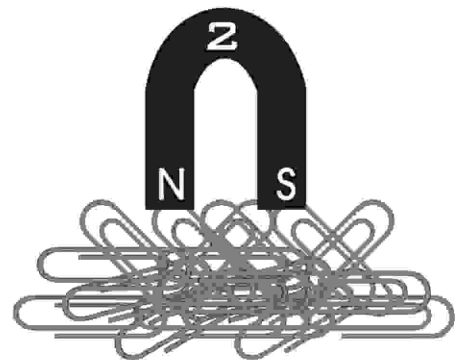
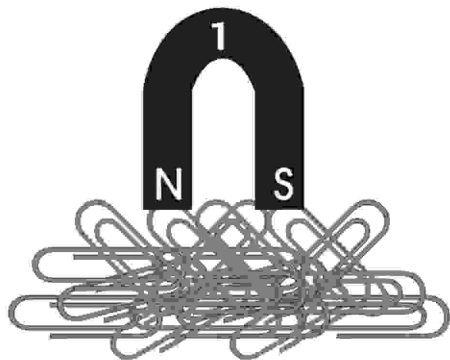
Horseshoe Magnet 1 _____

Horseshoe Magnet 2 _____

RESULT

Trial 1 _____ Trial 2 _____ Trial 3 _____

Trial 1 _____ Trial 2 _____ Trial 3 _____



CONCLUSION: What did you learn?

MAGNETS 7

Step 1: PREDICT: What will happen if you place a bar magnet flat on a line of paperclips, as shown in Picture 1? How many paperclips will it lift? Record your prediction.

Step 2: EXPERIMENT 1: Form the paperclips into a line as long as the bar magnet. Place the magnet flat on the pile and slowly lift it. Record the number of paperclips lifted by the magnet. Draw a picture of the magnet and paperclips in the space below.

Step 3: PREDICT: What will happen if you place a bar magnet on its side in the paperclips, as shown in Picture 2? How many paperclips will it lift? Record your prediction.

Step 4: EXPERIMENT 2: Form the paperclips into a line as long as the bar magnet. Place the magnet on its side on the pile and slowly lift it. Record the number of paperclips lifted by the magnet. Draw a picture of the magnet and paperclips below.

PREDICTION

Bar Magnet Flat _____

Bar Magnet Side _____

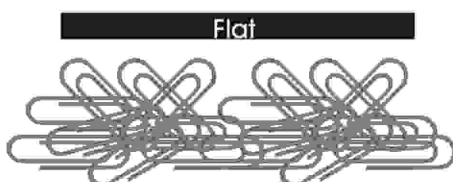
RESULT

Bar Magnet Flat _____

Bar Magnet Side _____

CONCLUSION: What did you learn?

PICTURE 1



PICTURE 2



MAGNETS 8

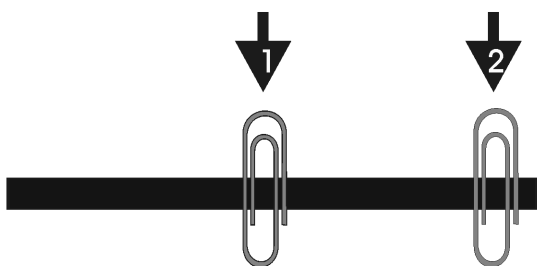
- Step 1: PREDICT: What will happen if you place a paperclip across the middle of a magnet, as shown in Picture 1 with the arrow? Write what you think will happen.
- Step 2: EXPERIMENT 1: Place a bar magnet on its side on the table. Place a paperclip across the middle of the magnet like in Picture 1. Do this three times. Record what happened.
- Step 3: PREDICT: What will happen if you place a paperclip across the end of a magnet, as shown in Picture 1? Write what you think will happen.
- Step 4: EXPERIMENT 2: Place a paperclip across one end of the magnet like in Picture 1. Record what happened.
- Step 5: PREDICT: What will happen if you cover the ends of a bar magnet with your hands, like in Picture 2? How many paperclips will it lift? Record your prediction below.
- Step 6: EXPERIMENT 3: Cover the ends of a bar magnet with your hands. Touch the middle of the magnet to a pile of paperclips. How many did it lift? Record your data.

PREDICTION _____

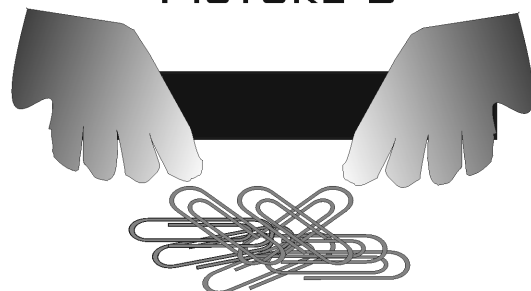
RESULT _____

CONCLUSION: What did you learn?

PICTURE 1



PICTURE 2



MAGNETS 9

- Step 1: PREDICT: What will happen if you place two bar magnets together with opposite poles touching? How many paperclips will the magnets lift? Record your prediction.
- Step 2: EXPERIMENT 1: Place two bar magnets with flat sides and opposite poles together, like in Picture 1. Place one end in the paperclips and slowly lift. Record your data.
- Step 3: PREDICT: What will happen if you place two bar magnets together with the same poles touching? How many paperclips will they lift? Record your prediction.
- Step 4: EXPERIMENT 2: Place two bar magnets together with the same poles together. Place one end in the paperclips and slowly lift. Record your data.
- Step 5: PREDICT: What will happen if you place two horseshoes with opposite poles together, like in Picture 2? How many paperclips will the magnets lift? Record your prediction.
- Step 6: EXPERIMENT 3: Place two horseshoes with opposite poles together, like in Picture 2. Place the ends of the magnets in the paperclips and slowly lift. Record your data.
- Step 7: PREDICT & EXPERIMENT: Repeat Steps 5 and 6 with the same ends of the horseshoe magnets together. Record your prediction and your data.

PREDICTION

Two Bar Magnets N-S _____

Two Bar Magnets N-N _____

Two Horseshoes N-S _____

Two Horseshoes N-N _____

RESULT

Two Bar Magnets N-S _____

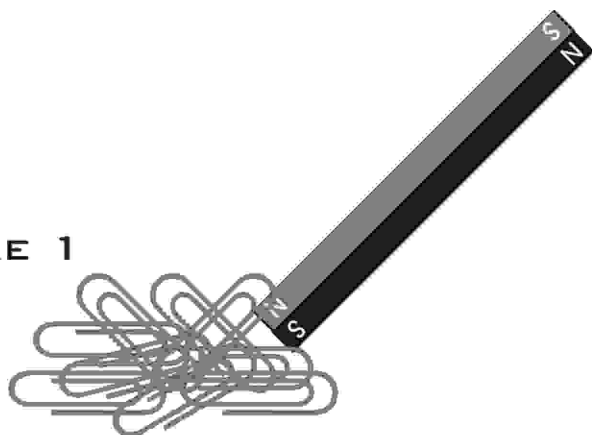
Two Bar Magnets N-N _____

Two Horseshoes N-S _____

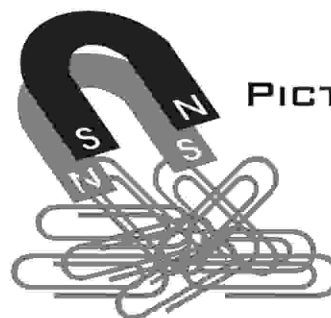
Two Horseshoes N-N _____

CONCLUSION: What did you learn?

PICTURE 1



PICTURE 2



MAGNETS 10

How does temperature affect a magnet?

Step 1: **CONTROL:** Place the paperclips in a container of room temperature water. Place the N pole of Bar Magnet 1 into the paperclips and slowly lift. Record the number of paperclips the magnet lifts.

Step 2: **PREDICT:** How many paperclips will a magnet lift in cold water? Record your prediction.

Step 3: **EXPERIMENT 1:** Place the paperclips in a container of very cold water. Place the N pole of Bar Magnet 1 into the paperclips and slowly lift. Record your data.

Step 4: Repeat Steps 2 & 3 with a container of very warm water. Record your data.

PREDICTION

Room Temperature Water _____

Very Cold Water _____

Very Warm Water _____

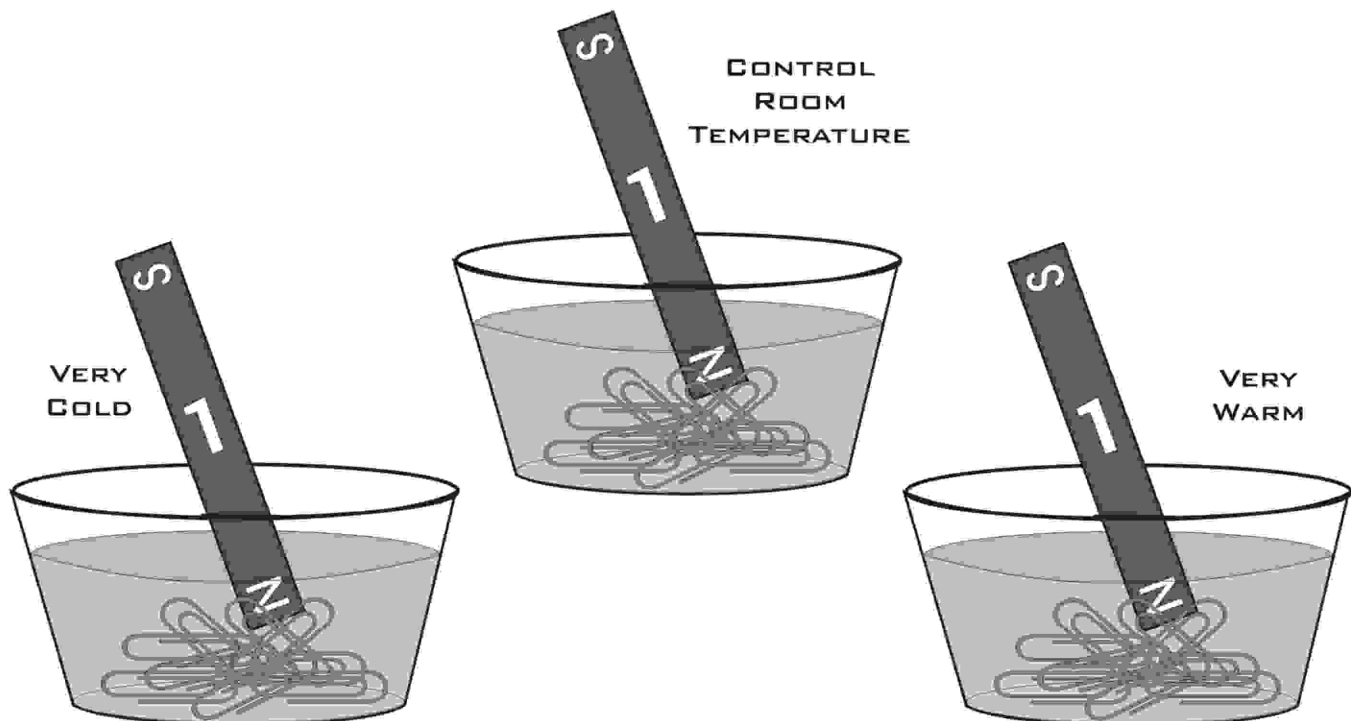
RESULT

Room Temperature Water _____

Very Cold Water _____

Very Warm Water _____

CONCLUSION: What did you learn?



MAGNETS 1 1

Can you block the force of magnets?

Step 1: PREDICT: How many pieces of paper must you place between two bar magnets to stop the force of one magnet from lifting the other?

Step 2: EXPERIMENT 1: Place Bar Magnet 1 flat on the table. Place a piece of paper over the magnet. Place Bar Magnet 2 on top of the paper over Bar Magnet 1 with the opposite poles together, like in the picture. Slowly lift the top magnet. Add paper one piece at a time until the bottom magnet will not lift. Record your data.

Step 3: OBSERVE: Examine the plastic, aluminum foil, and wood.

Step 3: PREDICT: How many pieces of plastic, aluminum foil and wood must you place between two bar magnets to stop the force of one magnet from lifting the other?

Step 4: EXPERIMENT 2: Repeat Step 2 with pieces of plastic, aluminum foil and wood. Record your data.

PREDICTION

Pieces of Paper	_____
Pieces of Plastic	_____
Pieces of Aluminum Foil	_____
Pieces of Wood	_____

RESULT

Pieces of Paper	_____
Pieces of Plastic	_____
Pieces of Aluminum Foil	_____
Pieces of Wood	_____

CONCLUSION: What did you learn?



MAGNETS 1 2

Can you block the force of magnets with paperclips?

Step 1: PREDICT: Look at Picture 1. If you place another bar magnet on top with opposite poles together, will the top magnet be able to lift the bottom magnet when a paperclip is placed in this position? Record your prediction.

Step 2: EXPERIMENT 1: Place Bar Magnet 1 flat on the table. Place a paperclip on it as shown in Picture 1. Place Bar Magnet 2 on top of Bar Magnet 1 with opposite poles together and lift. Record your data.

Step 3: PREDICT & EXPERIMENT 2: Repeat Steps 1 & 2 with three paperclips using Picture 2 as a guide.

Step 4: PREDICT & EXPERIMENT 3: Repeat Steps 1 & 2 with 10 paperclips using Picture 3 as a guide.

PREDICTION

Picture 1: yes no

Picture 2: yes no

Picture 3: yes no

RESULT

Picture 1: yes no

Picture 2: yes no

Picture 3: yes no

CONCLUSION: What did you learn?

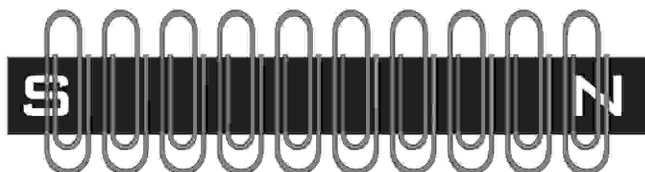
PICTURE 1



PICTURE 2



PICTURE 3



MAGNETS 13

Can you make a magnet?

A compass points to the Earth's North pole because its needle is a magnet.

WARNING: KEEP THE COMPASS FAR AWAY FROM THE MAGNETS.

Step 1: Place the needle across the middle of the plastic disk and tape it, like in the picture.

Step 2: Fill the plastic container with water. Carefully place the plastic disk on the surface of the water so that it floats.

Step 3: Compare the direction of your needle with the direction of the compass needle.

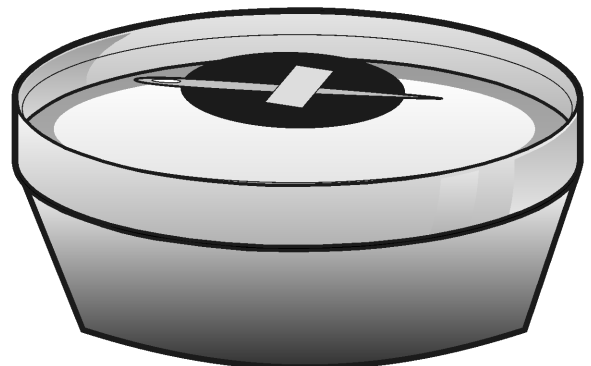
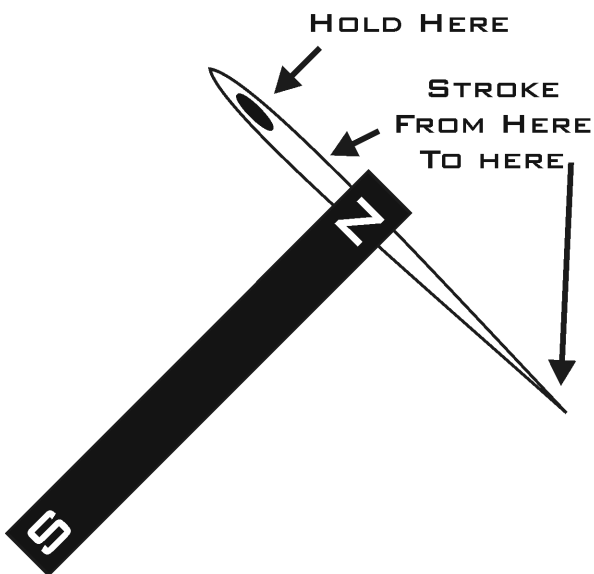
Step 4: Remove the needle from the disk and hold it very carefully between your thumb and index finger.

Step 5: With your other hand, stroke a bar magnet down the needle from your finger to the end of the needle. Do not stroke up the needle. Stroke the needle 10 times.

Step 6: Tape the needle onto the disk again and place it in the container of water.

Step 7: Compare the direction of your needle with the direction of the compass needle.

CONCLUSION: What did you learn?



MAGNETS 14

Can you make a magnet float in the air?

Step 1: Look at the six rectangular magnets with holes in the middle. They have no poles marked on them. Arrange the magnets in a line on the table so that their poles are opposite - North to South to North to South.

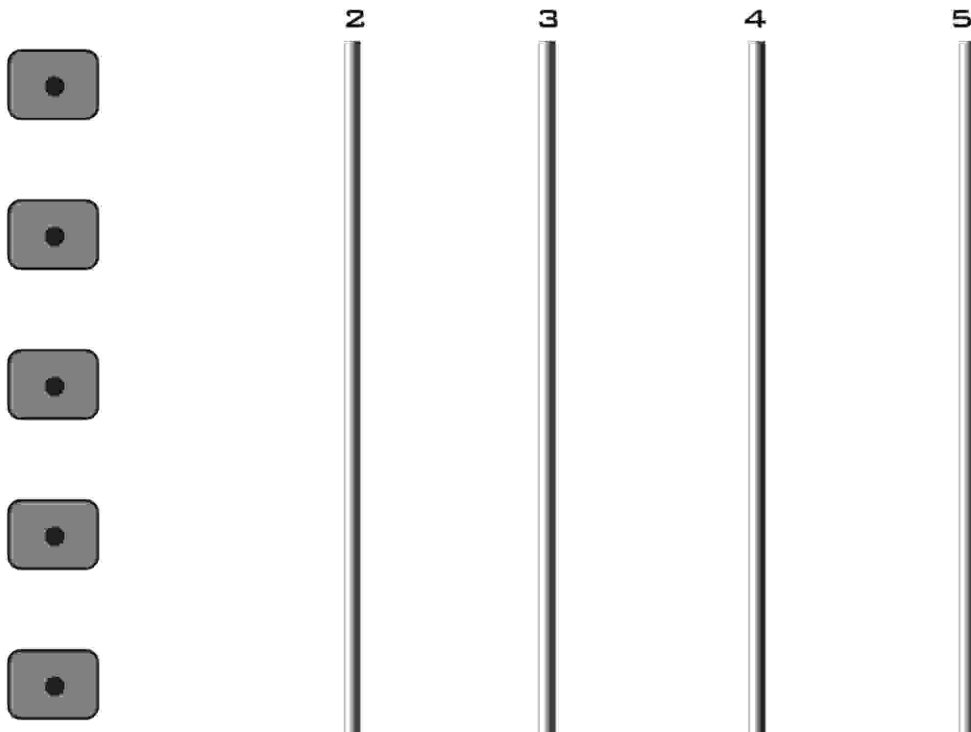
Step 2: Hold the wooden stick by one end so that it points straight up.

Step 3: Slide one magnet onto the stick, so that it rests on your fingers. Slide another magnet onto the stick so that it repels the first magnet; so that the like poles are together. Draw the two magnets on Stick 2, showing the distance between the two magnets.

Step 4: Slide a third magnet onto the stick so that it repels the second magnet. Draw the three magnets on Stick 3.

Step 5: Slide the other magnets onto the stick one at a time with each one repelling the one next to it. Draw the magnets on Sticks 4 - 5.

CONCLUSION: What did you learn?

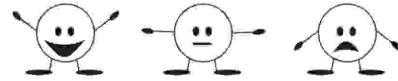


THINK ABOUT IT

How well did you work? Did you do your part in the group?
Circle the picture that shows how you and your group worked.

YOUR WORK

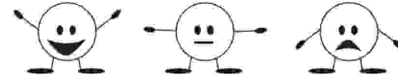
1. I did all my work.



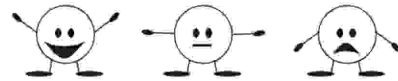
2. I followed directions.



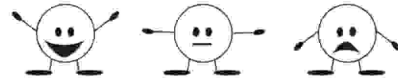
3. I was careful.



4. I asked questions.



5. I listened to others.

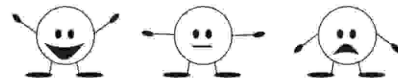


6. I helped the group.

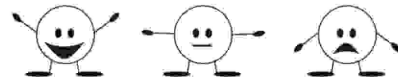


YOUR GROUP

1. We worked together.



2. We helped each other.



3. We listened to each other.



4. We were careful.



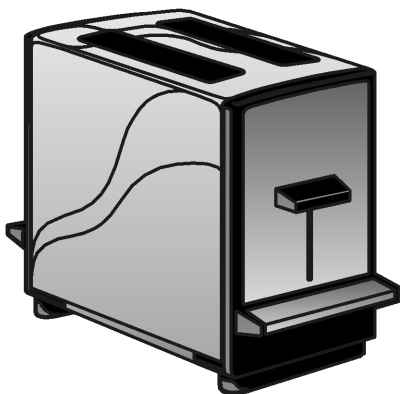
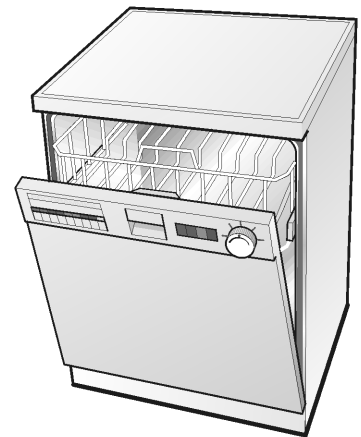
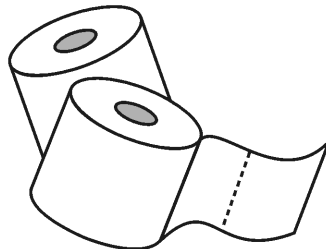
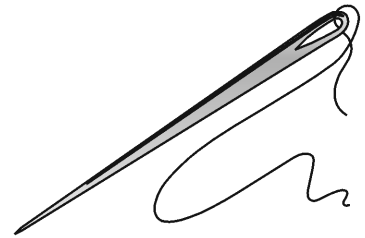
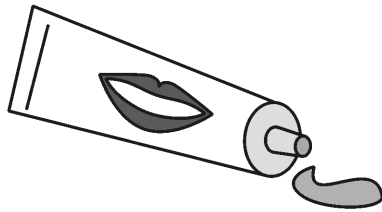
5. We all helped clean up.



WHAT YOU LIKED BEST: _____

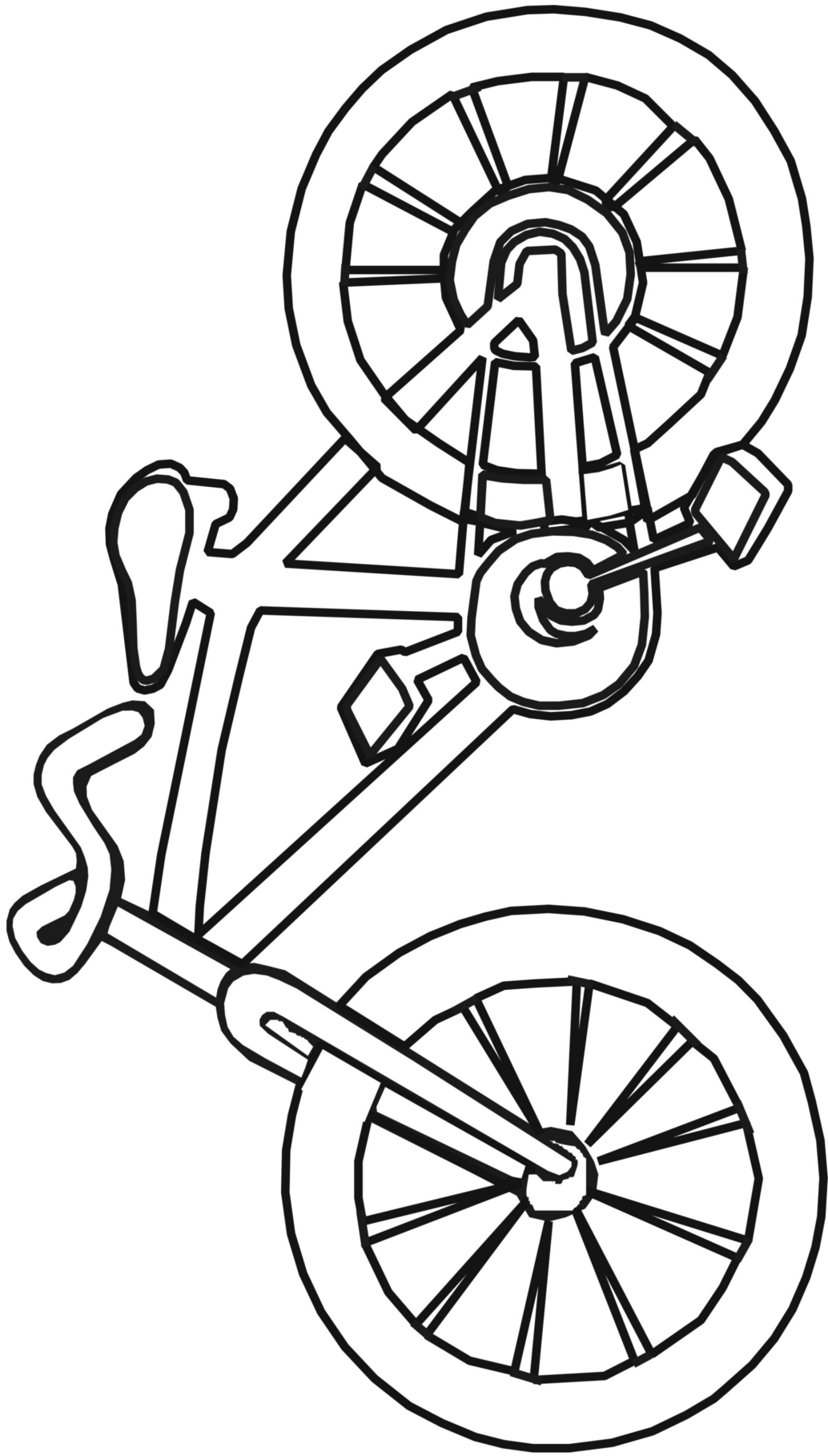
NAME: _____

Circle the objects that a magnet **will not** attract.

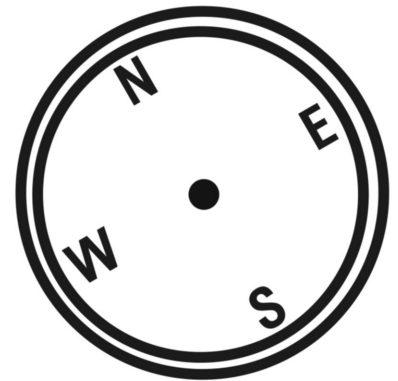
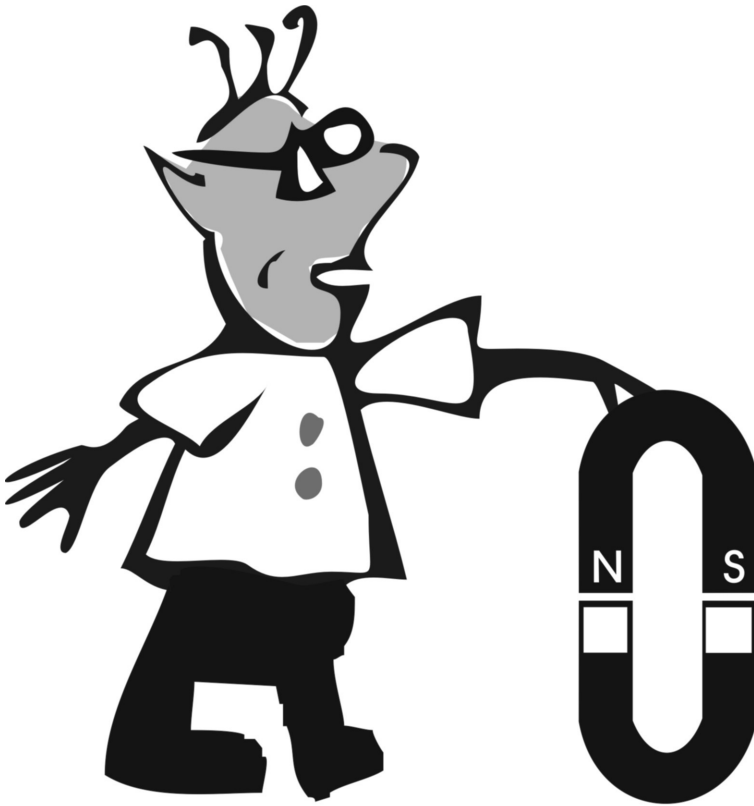


NAME: _____

Color the parts that a magnet might attract blue.
Color the parts that a magnet won't attract red.

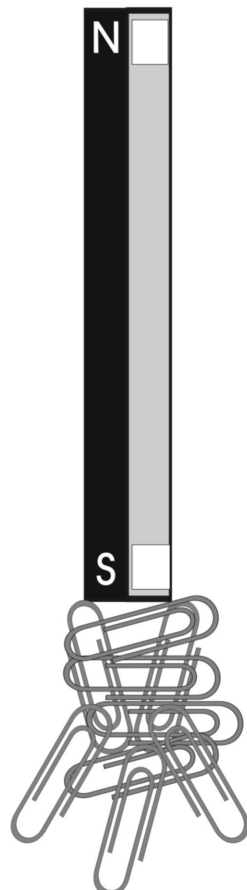


NAME: _____

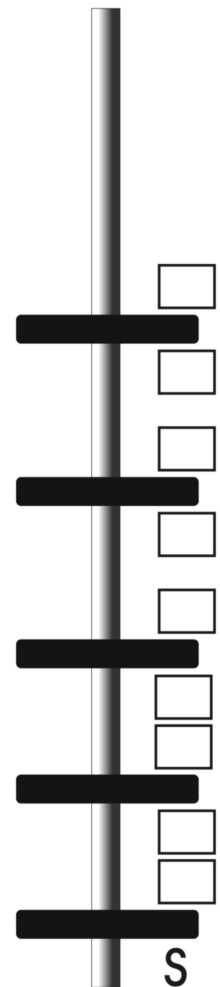


Draw the needle for the compass.

Write the poles of the magnet in the boxes.

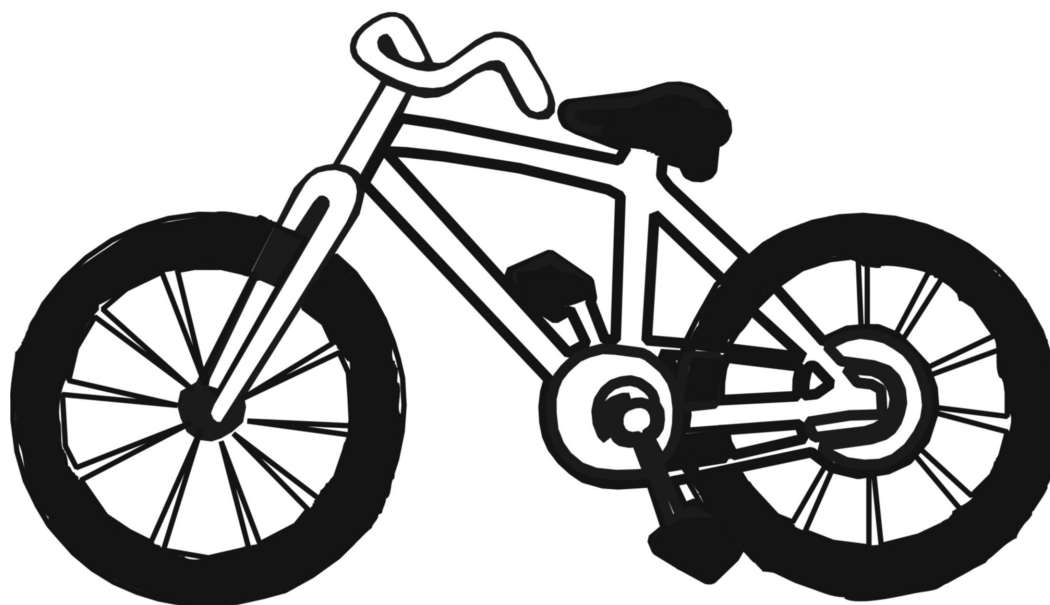
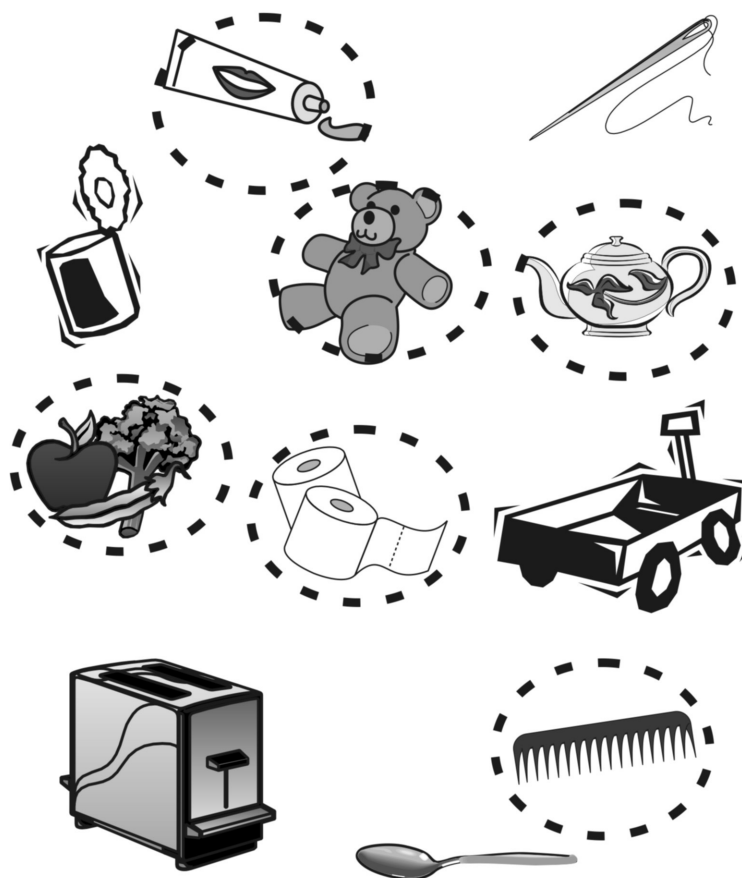


Write the poles of the magnets in the boxes.



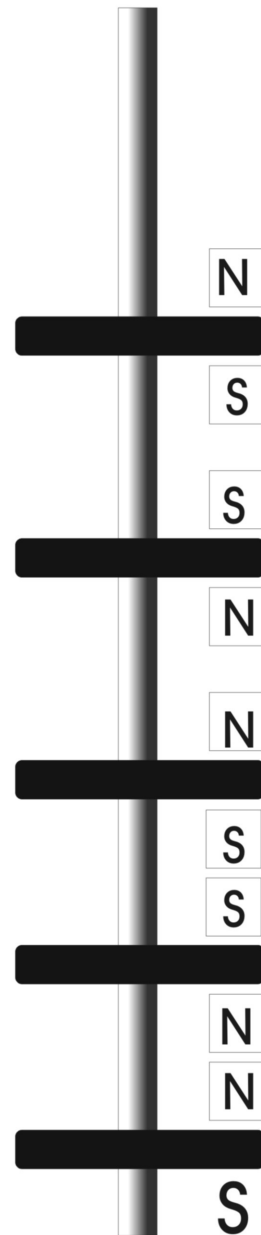
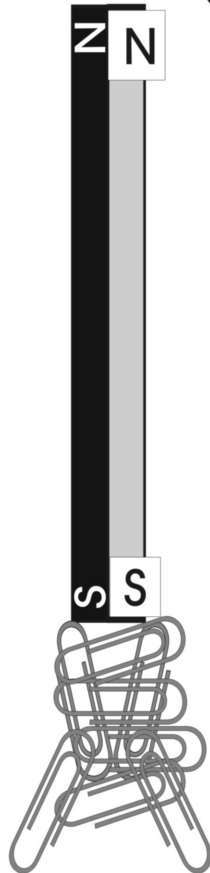
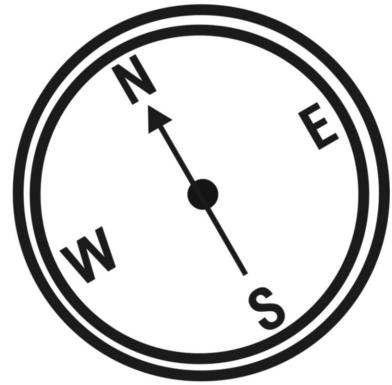
Write the poles of the magnets in the boxes.

Answers 102



Darkened parts will not attract a magnet.
Light parts might - depending on the metal.

Answer 3



EXPLORING MAGNETS

Evaluation Form

State: _____ Grade Level: _____ Number of Students: _____

- | | | |
|--|-----|----|
| 1. Did you conduct the entire activity? | Yes | No |
| 2. Were the instructions clear and easy to follow? | Yes | No |
| 3. Did the activity meet your academic objectives? | Yes | No |
| 4. Was the activity age appropriate? | Yes | No |
| 5. Were the allotted times sufficient to conduct the activity? | Yes | No |
| 6. Was the activity easy to use? | Yes | No |
| 7. Was the preparation required acceptable for the activity? | Yes | No |
| 8. Were the students interested and motivated? | Yes | No |
| 9. Was the energy knowledge content age appropriate? | Yes | No |
| 10. Would you use the activity again? | Yes | No |

How would you rate the activity overall (excellent, good, fair, poor)?

How would your students rate the activity overall (excellent, good, fair, poor)?

What would make the activity more useful to you?

Other Comments:

Please fax or mail to:

NEED Project
PO Box 10101
Manassas, VA 20108
FAX: 1-800-847-1820

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